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(19) (CA) **CANADIAN PATENT** (12)

(54) Convex Tablet Configuration

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ABSTRACT OF THE DISCLOSURE

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A tablet is disclosed which possesses an improved outer shape which reduces packaging costs, by reducing the size and thickness of packaging materials when the tablet is sealably packaged between two sheets of packaging material. The tablet defines at least one and preferably two convex broad outer surfaces, each convex surface including a peripheral convex section that is preferably beveled, and a central convex section that may be conical in shape. The outer surfaces of the peripheral and the central convex sections define between them an at least, and preferably greater than, 180° angle, and at their junction define further a continuous ridge. The convex table configuration also increases the surface area of the tablet, in the instance where it is to be dissolved in a liquid, and reduces the incidence of tablet "shingling" that obstructs tablet packaging.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A tablet having an improved shape for more economical sealable packaging, comprising:
 - a. paired broad outer surfaces generally opposed to each other and terminating in substantially parallel, spaced-apart perimeters, at least one of said broad outer surfaces being distended convexly away from the other and having a central convex section and a peripheral convex section disposed perimetrical adjacent thereto, the external angle between the central convex section and the peripheral convex section being greater than or equal to 180°; and
 - b. a continuous rim extending transversely between the surface perimeters of the broad outer surfaces.
2. The tablet of claim 1, wherein both of said broad outer surfaces are distended convexly away from each other and cooperate to define a bi-convex configuration.
3. The tablet of claim 1 or 2, wherein said continuous rim defines a cylinder.
4. The tablet of claim 2, wherein said broad outer surfaces are symmetrically convexly distended away from each other.
5. The tablet of claim 1 or 2, wherein said convex sections are integral and continuous with each other.
6. The tablet of claim 1 or 2, further comprising a continuous ridge defined on the exterior of said convexly distended broad outer surfaces at the junction of said central and said peripheral convex sections.
7. The tablet of claim 1 or 2, wherein said peripheral convex section defines an essentially frusto-conical shape.

8. The tablet of claim 1 or 2, wherein said central convex section defines an essentially conical shape.

9. The tablet of claim 1 or 2, wherein said central convex section defines an essentially pyramidal shape.

10. The tablet of claim 2, wherein the outer surfaces of the peripheral convex sections subtend between them an acute angle.

11. The tablet of claim 10, wherein said acute angle is less than 45° .

12. The tablet of claim 2, wherein the radius of the central convex section ranges from 20% to 80% of the total radius of said broad outer surface.

13. The tablet of claim 12, wherein the radius of said central convex section ranges from 30% to 70%.

14. The tablet of claim 11, wherein the radius of said central convex section ranges from 50% to 65%.

15. The tablet of claim 1 or 2, including a household cleaning composition therein.

16. The tablet of claim 1 or 2, including a medicinal compound therein.

17. A sealably packaged tablet comprising, in combination:

- a. a tablet package comprising opposed, conformable package sheets peripherally adhered to each other, and defining centrally between them an air-tight tablet pouch; and
- b. a tablet comprising paired broad outer surfaces generally opposed to each other and terminating in substantially parallel, spaced apart surface perimeters,

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at least one of said broad outer surfaces being distended convexly away from the other and having a central convex section and a peripheral convex section disposed perimetrical adjacent thereto, the external angle between the central convex section and the peripheral convex section being greater than or equal to 180° , and a continuous rim extending transversely between the surface perimeters of the broad outer surfaces;

whereby the shape of the tablet, when combined with conformable package sheets, permits the tablet pouch to be reduced in size and thickness without rupture.

18. The combination of claim 17, wherein both of said broad outer surfaces are distended convexly away from each other and cooperate to define a bi-convex configuration.

19. The combination of claim 17 or 18, wherein said continuous rim defines a cylinder.

20. The combination of claim 18, wherein said broad outer surfaces are symmetrically convexly distended away from each other.

21. The combination of claims 17 or 18, wherein said convex sections are integral and continuous with each other.

22. The combination of claim 17 or 18, further comprising a continuous ridge defined on the exterior of said convexly distended broad outer surfaces at the junction of said central and said peripheral convex sections.

23. The combination of claim 17 or 18, wherein said peripheral convex section defines an essentially frustoconical shape.

24. The combination of claim 17 or 18, wherein said central convex section defines an essentially conical shape.

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25. The combination of claim 17 or 18, wherein said central convex section defines an essentially pyramidal shape.

26. The combination of claim 18, wherein the outer surfaces of the peripheral convex sections subtend between them an acute angle.

27. The combination of claim 26, wherein said acute angle is less than 45°.

28. The combination of claim 18, wherein the radius of the central convex section ranges from 20% to 80% of the total radius of said broad outer surface.

29. The combination of claim 28, wherein the radius of said central convex section ranges from 30% to 70%.

30. The combination of claim 27, wherein the radius of said central convex section ranges from 50% to 65%.

31. The combination of claim 17 or 18, including a household cleaning composition therein.

32. The combination of claim 17 or 18, including a medicinal compound therein.

33. The combination of claim 17, wherein said sheets are prepared from a material comprising aluminum foil.

34. The combination of claim 33, wherein said foil is of a thickness on the order of 0.0007" gauge.

35. A method for preparing a tablet having an improved surface configuration comprising compressing the material to be tabletted within a form having at least one broad concave surface shaped such that it will produce a tablet having at least one broad outer surface distended convexly away from its other broad surface and having a central convex and a peripheral convex section disposed

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perimetricaly adjacent thereto, the external angle between the central convex section and the peripheral convex section being greater than or equal to 180°.

36. The method of claim 35, wherein the form has two opposed broad concave surfaces shaped such that it will produce a tablet having two convex broad outer surfaces.

37. The tablet of claim 1 or 2, wherein the central convex section has a frusto-geometrical shape.

38. The combination of claim 17 or 18, wherein the central convex section has a frusto-geometrical shape.

19



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BACKGROUND OF THE INVENTIONField of the Invention:

The present invention relates to the manufacture of tablets, and more particularly to the manufacture of tablets to be
5 sealed in pouches defined by paired sheet materials.

Description of the Prior Art:

- Most tablets, whether for medicinal purposes or otherwise, are manufactured with essentially the same basic shape of
10 essentially flat broad surfaces. In many instances, such as when the tablets contain some active chemical agent, they are desirably vacuum sealed within sheet-like packaging in sandwich relationship, in such manner that the sheets converge to form a pouch about the tablet defining a perimeter generally corresponding to a circle.
- 15 Conventional tablet shape is defined in cross-section by essentially flat, parallel broad surfaces, sometimes defining at the circumferential periphery a slight bevel, that has been provided primarily to minimize tablet edge fracture.
- 20 The high cost of raw materials, including packaging materials has prompted consideration of ways to reduce incidental costs to keep down the ultimate cost of the tablet product. Consideration has therefore recently been given to a reduction in the packaging material requirements
25 for tablets, and a review of the prior art tablet discloses a substantial amount of unused space in the package pouch.
- In particular, the unused space or wastage is most apparent when the tablet is of increased thickness, the latter to assure sufficient tablet strength during manufacture and shipping. Also, in the instance where the tablet is of



increased thickness and is packaged by sealing within pouches formed by parallel sheet materials, the conventional tablet configuration has been found to exert a strain on the package that causes the seals between the package sheets to rupture, with the result that product shelf life is reduced and spoilage may occur.

Another problem that has existed concerns the packaging of the tablets. Generally, tablet packaging is performed by the adhesive bonding of parallel sheets of packaging material, with non-bonded areas defined periodically on the sheets to provide pouches to retain the tablets. The tablets are usually conveyed while resting on their broad surfaces, and reach a chute, where the tablets drop vertically downward and are then conveyed between the package sheets as they are brought together to seal off the pouch area.

During the foregoing procedure, the tablets occasionally tend to stack or ride upon each other in the course of the vertical drop into position between the package sheets. This occurrence, known as "shimming" is undesirable and can cause jamming of the packaging machinery, so that the machinery must be shut down to remove the extra tablets from the pouch. Naturally, such difficulties are time consuming and add to manufacturing expense.

It therefore exists to correct the difficulties recognized in the prior art, to provide a tablet that reduces packaging costs, by reducing both the size and thickness of the packaging materials, as well as a reduction in the incidence of package failure. Also, it would be desirable to prepare a tablet that reduces or eliminates the occurrence of "shimming" during packaging.

SUMMARY OF THE INVENTION

In accordance with the present invention, a tablet having an improved configuration for more economical sealable packaging and reduced spoilage, comprises paired broad outer surfaces generally opposed to each other and terminating in substantially parallel, spaced apart surface perimeters, at least one of the surfaces extending convexly away from the other and defining a central convex section, and a perimetrical adjacent peripheral convex section. A continuous rim extends transversely between the surface perimeters and preferably defines a cylinder. In a preferred embodiment, both broad outer surfaces extend convexly and cooperate to define a bi-convex configuration.

The tablet of the present invention preferably comprises paired broad outer surfaces that extend convexly away from each other, with each outer surface having respective convex sections defining exterior surfaces disposed at an angle of at least, and preferably greater than, 180° with respect to each other. A continuous ridge is preferably defined on the exterior of the broad outer surfaces at the junction of the central and peripheral convex section, and this outer edge defines the tablet point bend, i.e. the point at which the walls of the pouch containing the tablet are drawn toward adhesive contact with each other. Preferably, the walls and the outer surfaces of the peripheral convex sections subtend between them an acute angle, which more preferably may be less than 45°.

The invention also relates to a sealably packaged tablet which comprises, in combination, an essentially planar tablet package prepared from opposed package sheets peripherally adhered to each other and defining periodically between them, centrally disposed, air-tight tablet pouches containing the tablets of the invention as described above. The present

packaged tablet utilizes a pouch that is reduced in size while retaining the capability for holding a tablet having equivalent weight and content to those of the prior art.

The invention also includes a method for preparing an improved tablet, comprising compressing the material to be prepared in tablet form within a tablet die defining broad outer surfaces of which at least one and preferably two are concave in configuration, and thereby adapted to form a tablet having broad outer surfaces of convex shape. Preferably, both broad surfaces of the ^{die} are concave, and a tablet having bi-convex configuration is formed. Further, the die may be configured to correspond in shape to the tablet configurations set forth above.

Tablets prepared in accordance with the invention permit packaging material to be reduced in amount by as much as 20 to 25% in size, while package sheet thickness may be reduced as much as 30%. Also, tablets of the present configuration resist breakage and spalling during manufacture and shipping, and the packaging machinery jamming is reduced due to a corresponding reduction in the incidence of "shimming".

The present invention is applicable to tablets for a variety of uses extending from medicinal compounds to household goods. The exact angulation and size of individual tablets will be governed by the materials being formed, however the basic convex configuration is utilized in each instance.

Accordingly, it is a principal object of the present invention to provide a tablet having at least one broad outer surface with a convex configuration.

It is a further object of the present invention to provide a tablet as aforesaid which realizes a savings in packaging material.

It is a further object of the present invention to provide a tablet as aforesaid which offers improved strength and economy of processing.

5 It is a yet further object of the present invention to provide a method for preparing a tablet comprising forming the broad surfaces of the tablet in convex relationship to each other.

10 Other objects and advantages will become apparent to those skilled in the art from a review of the ensuing description which proceeds with reference to the following illustrative drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a tablet prepared in accordance with the present invention.

15 Figure 2 is a side view illustrating the tablet of Figure 1.

Figure 3A is a side sectional view illustrating a tablet prepared in accordance with the prior art; enclosed in a sealed package.

20 Figure 3B is a side sectional view similar to Figure 3A illustrating the tablet of the present invention.

Figure 4A is a top view partly in phantom illustrating the tablet shown in Figure 3A.

Figure 4B is a top view partly in phantom illustrating the tablet of Figure 3B.

25 Figures 5 and 6 are side views illustrating tablets in accordance with alternate embodiments of the present invention.

Figure 7 is a side sectional view illustrating an alternate tablet within a package.

Figure 8 is a perspective view of a further alternate embodiment of the present invention.

Figure 9 is a perspective view of a further embodiment of the present invention.

10 Figure 10 is a perspective view of a further embodiment of the present invention.

DETAILED DESCRIPTION

Referring to the drawings, wherein like numerals designate like parts, and particularly to Figures 1 and 2, tablet 10 comprises paired broad outer surfaces 12 generally opposed to each other and terminating in substantially parallel spaced apart surface perimeters 14. A continuous rim 16 extends transversely between surface perimeters 14 as shown, and may preferably define a cylinder as shown in certain of the Figures.

As shown in Figures 1 and 2, both surfaces may be convexly extended; however, the invention includes the instance where only one surface 12 is convex, and this will be described with reference to Figure 7, later on.

Broad surfaces 12, when convexly extended as shown, comprises a central convex section 18 and a peripheral convex section 20 that is located annularly adjacent to it. Preferably, sections 18 and 20 are integral with each other, and may, as shown in Figures 6 and 7 extend continuously with each other. Alternately, convex sections 18 and 20 may define exterior surfaces that are disposed at an angle with respect to each other that may preferably be greater than 180°.

In particular, and with reference to Figure 2, an angle α is shown that is defined by the exterior surfaces of convex sections 18 and 20.

In a further aspect of the present invention, convex section 20 may define a beveled surface that conforms to the frustum

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of a cone, in the instance where tablet 10 is circular in shape. Similarly, convex section 18, while graduated at a differing angle of inclination than that of section 20, may define in one embodiment an essentially conical configuration. The shape of respective convex sections 18 and 20 may accordingly vary, and, for example, as illustrated in Figure 8, convex section 18' may define a shape that is essentially pyramidal, in combination with the essentially frustoconical shape of section 20. The invention contemplates a variety of shape combinations within its scope, and should not be limited to specific combinations illustrated herein.

Referring further to Figures 1 and 2, in the instance where convex sections 18 and 20 differ in slope as shown, they define at their junction a continuous ridge 22 which, in the illustrations herein may comprise a circle. The invention includes ridges having oval, square, rectangular, and other shapes within its scope.

20

One of the important aspects of the present invention comprises the configuration of the peripheral convex section 20. In particular, and with reference to Figure 2-3B, one of the advantages of the present configuration is that it reduces the strain on the packaging material in the instance where the tablet is sealably packaged within two parallel package sheets, and permits reductions in both packaging sheet gauge and size, as will be more particularly explained.

30

Referring to Figure 3B, a packaged tablet is shown which comprises tablet 10 disposed within a package 24 consisting of paired, opposed package sheets 26 that have been peripherally bonded to each other, and in their non-bonded area, define a

package pouch 28 to hold the tablet. Correspondingly, Figure 3A illustrates a packaged tablet in accordance with the prior art, and tablet 30 illustrated therein is thus enclosed within a tablet package 32 prepared from paired sheets 34 5 likewise peripherally bonded to define a central package pouch 36.

The differences between the respective packages include certain visual distinctions that are readily apparent. For example, tablet 30 utilizes essentially flat broad outer surfaces. 10 Both packages utilize an identical angle of taper of the package sheets to the point of sealable engagement. In each instance, an acute angle, labeled β is defined between respective sheets 26 in Figure 3B, and 34 in Figure 3A. Referring back to Figure 2, the exterior surfaces of peripheral convex sections 20 preferably define an acute angle corresponding 15 to angle β and therefore labeled identically, to facilitate the reduction in the size of pouch 28.

More specifically, the taper of sheets 26 and 34, respectively, begins at the tablet point bends 38 and 40, which mark the 20 point at which the taper of the packaging sheets is set to occur. In both instances, the identical angle of taper is utilized, and it can be seen that the tablet of the present invention permits the taper to commence earlier, thereby permitting the pouch 28 to be defined within a smaller area, and 25 correspondingly to define a reduced volume. The configuration of tablet 10 permits the same amount of tablet material to be contained within this smaller pouch, as that contained within pouch 36 holding tablet 30. Referring now to Figures 4A and 4B, comprising plan views partly in phantom of corresponding Figures 3A and 3B, it can be seen that the pouch 28 is reduced 30 in area from that of pouch 36 and a corresponding reduction is possible in the overall size of sheet 26 from that of sheet 34. It should be noted, that this reduction in packaging material is possible without the requirement of a decrease in

the diameter of the respective tablets. Thus, the surface perimeter 14 of tablet 10 is equal in size to the surface perimeter 42 of tablet 30, with the difference in the size and location of the respective tablet point bends 38 and 40, accounting for the decrease in the size of pouch 28 over pouch 36.

In addition to the reduction in the size of the packaging material, it has been found that the sheet material itself may be reduced in gauge, as the overall convexity of the outer surfaces 12 reduces the strain on the sheet materials that is normally imposed at the tablet point bend in the instance where the tablet is flat-faced, as illustrated in Figures 3A and 4A. The size of the external angle that is subtended by the central and peripheral convex sections, determined with the tablet point bend 38 as its apex, is thus less than the corresponding external angle that is disposed with tablet point bend 40 as its apex, in Figure 3A. The package sheet 26 is therefore less likely to rupture than corresponding package sheet 34, due to the configuration of respective tablets 10 and 30. Thus, while package sheet 34 has conventionally been prepared to a thickness of .001 gauge, package sheet 26 may be utilized at a reduced thickness of .0007 gauge, and provides sufficient package strength and integrity, to resist rupture and premature package leakage.

Several other advantages have also been found with the employment of the tablets of the present invention. The problem referred to earlier with respect to tablet packaging, comprising the tendency of tablets to stack or "shim" during conveyance to the package pouch, has been virtually eliminated by the provision of the tapered surfaces of the convex broad outer surfaces 12. The tapered surfaces of the tablets allow them to slide apart from each other so that individual tablets may be efficiently packaged without jamming package machinery.

Also, the outer shape of the tablets confers a further unexpected advantage, in the instance where the tablet includes a cleansing composition that operates when the tablet is dissolved to form a cleansing solution, such as in the instance where denture cleansers, toilet bowl cleaners and the like are prepared. When the tablet is dropped into the solution, the tendency is generally for the tablet to come to rest at the bottom of the container, resting on one of its broad surfaces. In the instance where the broad surfaces are flat, the surface area of the tablet available for interaction with the liquid in the container is limited, as the surface in contact with the bottom of the container is unexposed. By contrast, the present tablet configuration presents tapered broad surfaces, that would extend away from the bottom of the container and permit the liquid in the container to make surface contact to accelerate the disintegration of the tablet.

The method for preparing the tablet of the present invention comprises the preparation and use of tablet dies defining concave broad surfaces that correspond in shape to the convex broad outer surfaces desired in the tablet. Thus, either one or both of the broad outer surfaces may be defined in corresponding concavities within the tablet die, so that the appropriately configured tablets may be prepared. In other respects, tablet preparation does not differ from that of the prior art, as conventional tableting agents may be employed, and conventional forming pressures, etc. may be utilized. It is advisable to prepare the tablets of the present invention with essentially flat rims ¹⁶, as this prevents the occurrence of "shingling", ~~caused by that comprises~~ the surface discontinuities that sometimes are formed when the tablet edge is rounded.

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The tablets of the present invention may vary widely in exact shape, so long as at least one of the broad outer surfaces is

convexly extended as described. Preferably, the broad outer surfaces are symmetrically convex.

The exact size of central convex section 18 may vary within the scope of the invention, and may accordingly range in size from 20% to 80% in radius, of the total radius of the broad outer surface 12. Preferably, the central convex section may range in size from 30 to 70% of the total radius, and most preferably ranges from 50% to 65%. Also, in the instance where the tablet possesses a configuration similar to that of Figure 1, with a continuous ridge 22, the location of ridge 22 naturally may vary, depending upon the size of the central convex section.

Referring now to Figure 5, the variation in the size of the respective convex sections is illustrated, as peripheral convex section 20 appears larger than in Figure 2, while central convex section 18 is reduced. In Figure 6, a variant tablet 44 is shown which utilizes broad surfaces 46 that taper in convexity, so that the central convex section and the peripheral convex section are continuous with each other. All of the above variations are within the scope of the present invention.

A further embodiment is illustrated in Figure 7, wherein a tablet 48 is prepared which utilizes a single convex broad outer surface 50. This embodiment is specifically utilized in the instance where a package such as package 52 is employed. In such packages, only one of the sheets is expanded and forms a pouch, and thus a flat sheet 54 has adhesively bound thereto convexly expanded sheet 56, which defines the recess forming the tablet pouch 58. In this instance, it is desirable to provide a flat broad outer surface as shown,

however the advantages noted above with respect to the bi-convex tablet also obtain in the instance where the single convex surface is employed.

Figures 9 and 10 illustrate a further embodiment, wherein
5 the tablet is essentially rectangular in shape. Referring
to Figure 9, tablet 10" defines paired broad outer surfaces
12", which can be seen to be convex, in similar fashion to
surfaces 12 of Figure 1. Thus, surfaces 12" are comprised
10 of central convex sections 18", and peripheral convex sec-
tions 20" lying adjacent thereto. The separating ridge 22"
may vary in configuration from that of a circle, illustrated
in Figure 1 and Figure 9 herein, to that of a rectangle fol-
lowing essentially in parallel fashion surface perimeter 14".
In the former instance, peripheral convex section 20" appears
15 as four triangular subsections equally distributed in the corners
of the rectangular perimeter 14", while in Figure 10, peripheral
convex section 20" is essentially rectangular and frames central
convex section 18".

The tablets of Figures 9 and 10 are further variant in the
20 configuration of the rim 16", as it can be seen to vary in
thickness from a minimal thickness at the corners of the tablet,
A to a maximum thickness at the points centrally ^{intermediate} ~~immediate~~ the
corners.

The provision of a tablet in rectangular configuration as
25 shown can be appreciated to make further economic use of the
package pouch, as, in the instance where the pouch is rec-
tangular, the shape of the tablet assures complete utilization
of defined space. The other advantages discussed above with
respect to the tablet of the present invention are equally
30 demonstrated by this further embodiment, as the convex dis-
tention of the broad outer surfaces 12" reduces the strain

that is normally imposed upon the package pouch.

As noted earlier, the tablets prepared in accordance with the present invention may contain a variety of ingredients for various uses, including household and medicinal application.

- 5 The present tablet configurations are particularly useful in the instance where tablets are prepared for use as denture cleansers, toilet bowl cleaners and the like. In such instances, the tablet forming material may include active ingredients such as cleansers, pharmaceutical compositions, and the
- 10 like, again depending upon the particular utility of the tablet.

While there have been herein shown and described the preferred embodiment of the present invention, it will be understood that the invention may be embodied otherwise than as herein specifically illustrated or described, and that within

- 15 such embodiment certain changes in the detail and construction, and the form and arrangement of the parts may be made without departing from the underlying idea or principles of the invention within the scope of the appended claims.

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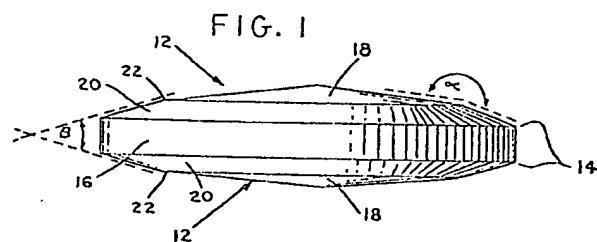
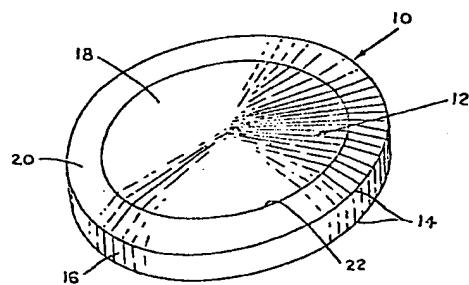


FIG. 2

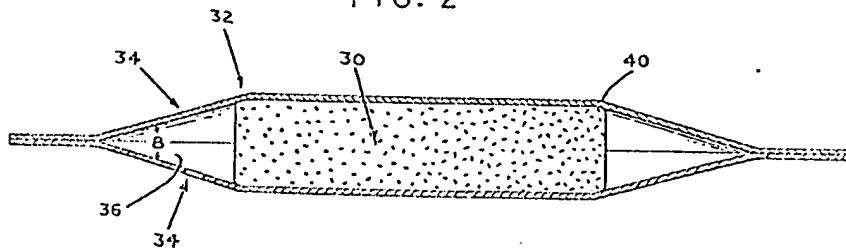


FIG. 3A

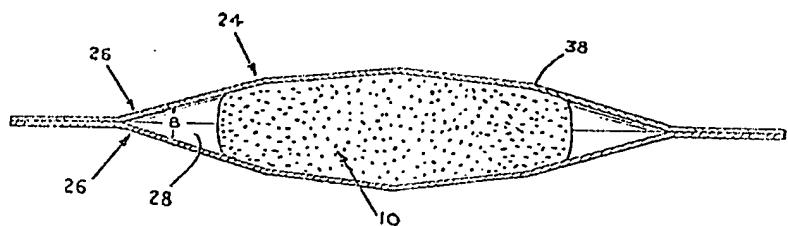


FIG. 3B

Alvin E. Martin

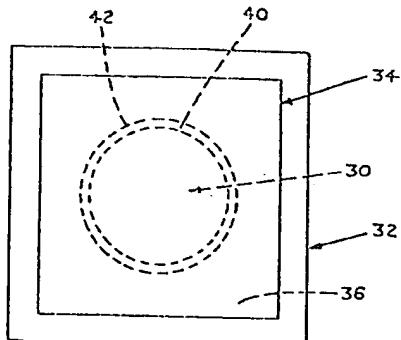


FIG. 4A

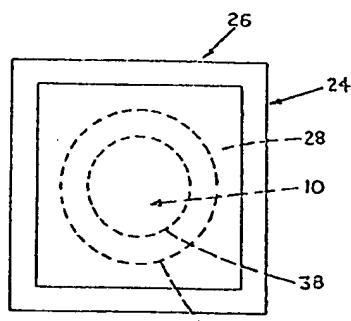


FIG. 4B

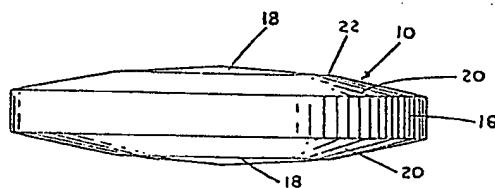


FIG. 5

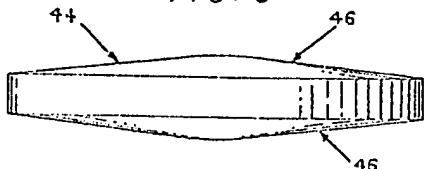


FIG. 6

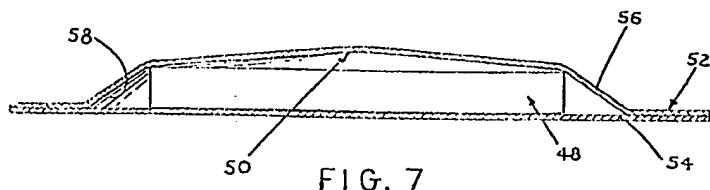


FIG. 7

Allen E. Martel Jr.

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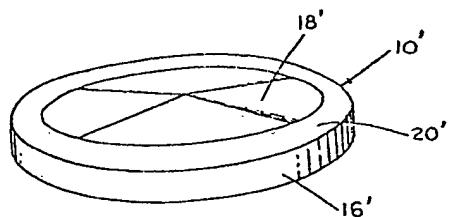


FIG. 8

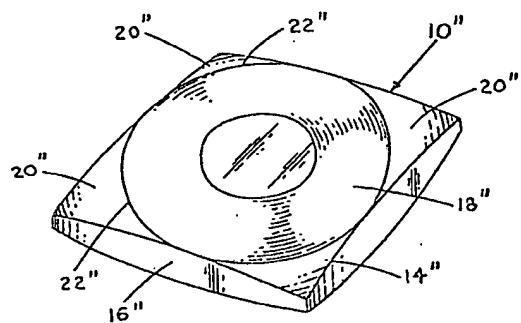


FIG. 9

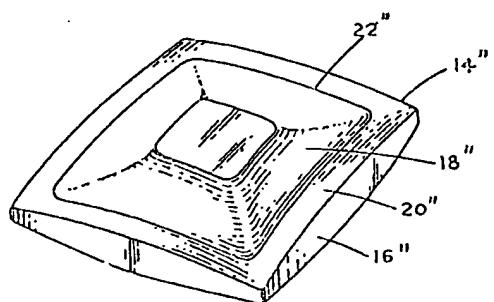


FIG. 10

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